1-1-2007

BladePro: 3D Automatic Grade Control System

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DOI: 10.5703/1288284315773

EMERGING CONSTRUCTION TECHNOLOGIES

Civil - Construction Equipment & Methods

BLADEPRO: 3D AUTOMATIC GRADE CONTROL SYSTEM

THE NEED

Currently most of the methods to control grading equipment to achieve the required production accuracy are based on conventional surveying, such as grade stakes and stringlines. Some methods using automatic measurement sensors were also developed to guide and/or control construction equipment efficiently. The use of laser transmitters and sonic tracers has greatly reduced the cost of construction projects. Yet, many existing systems do not work well with more complex grading applications such as vertical curves, transitions and super-elevated curves.

FIGURE 1 BLADEPRO: MOTORGRADER CONTROL SYSTEM

THE TECHNOLOGY

BladePro System, developed by Spectra Precision in 1998, is a dual automatic blade control system that uses advance computer technology and user friendly operator controls. This system provides contractors a three dimensional machine control system for roads, railway beds and airport runway construction. BladePro allows motorgrader operators to grade complex designs such as vertical curves, transitions, super-elevated curves and complex site designs without stakes or stringlines.

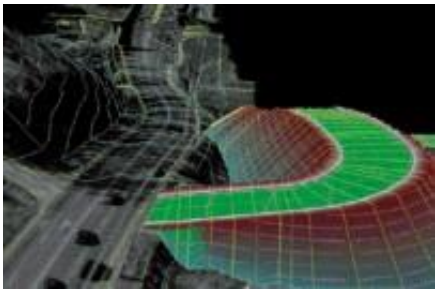

FIGURE 2 A DIGITAL TERAIN MODEL DESIGN

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http://dx.doi.org/10.5703/1288284315773

BladePro System combines a digital terrain model (DTM) design software, Geodimeter robotic total stations, and motorgrader control system to automatically control elevation and cross slope of the motorgrader blade. This flexibility is built into the BladePro system by using the Tracer Ultra Sonic Grade Controller or the Laserplane Transmitter and Receiver with Electric Mast. A graphical operator interface accepts digital design using a data card. BladePro uses a robotic total station to track and communicate the motorgrader's position and blade elevation anywhere on the job site by transmitting the real-time positioning data and by comparing it to the design stored on the data card. When a correction is needed signals will be sent to the machines hydraulics to maintain the design elevation and cross slope.

FIGURE 3 BLADE-PRO CONTROL SYSTEM

THE BENEFITS

- BladePro reduces surveying and engineering costs by eliminating stakes, hubs and stringlines.
- It increases productivity up to 50% by allowing the operator to grade in fewer passes and to control grade in real time.
- It saves materials by placing the planned amount of materials within a 1/4 inch without additional time and labor.

STATUS

Applications for BladePro include highway, residential roads, railway beds, airport runway, commercial and residential developments. Generally, the BladePro System can be used for any machine that requires dual automatic controls such as motorgraders, dozers, mills and trimmers.

BARRIERS

The limited distance between the robotic total station and the machine being controled may be the main shortcoming of this system.

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References

1. "Blade Pro 3D", Spectra Precision.
2. "BladePro Motorgrader Control System", Spectra Precision.
3. "Control System Works in 3-D", Engineering News Record, T-29, June 28, 1999
4. Kris Maas, "Spectra Precision Introduced the Third Dimension in Machine Control", Surveying Briefing Sheets and Articles, Machine Control Systems - Half Day Meeting, Joint Engineering Survey Board, 8 March 1999.
5. Spectra Precision Home Page, http://www.splp.com

Reviewers

Peer reviewed as an emerging construction technology

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Publisher

Emerging Construction Technologies, Division of Construction Engineering and Management, Purdue University, West Lafayette, Indiana

http://dx.doi.org/10.5703/1288284315773